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Typed Name: Kevin D. McCarthy
Date: April 28, 2009

0-05-106 - 15524/US/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Joshi et al.
Serial no.:	10/541,011
I.A. Filed:	December 29, 2003
Title:	ENHANCED GENERATION OF HYDROXYL RADICALS
Examiner:	Edna Wong
Art Unit:	1795
Confirmation:	9060

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Response

This response is in reply to the office action mailed on January 29, 2009. Applicant also submits an RCE cover sheet. Other than the RCE fees, no other fees are due since this response is filed within three months of the office action's mailing date.

Amendments

Please amend claim 1 as shown in the enclosed document. Amendments have been effected to clarify that the method of the present invention does not require any heating step. Antecedent basis for the amendment is found throughout the examples set forth in the specification that indicate the reaction occurs at ambient temperature.

Claim Rejections – 35 USC §103

The Examiner rejects claims 1, 4-6 and 8-16 as being unpatentable over CS 274995 in combination with US 6,793,903 and Jen et al., *J. of Chrom. A*, Vol. 796:283-288 (1998). The Applicant respectfully traverses the Examiner's objection.

CS 274995 (CS '995) relates to a method of photo-oxidation of complex-forming substances with oxygen or with oxygen and an initiating hydrogen peroxide additive in the presence of ions of iron, copper and nickel as photocatalysts (page 1, lines to 4). As stated by the Examiner in the Office Action of August 26, 2008, an average person skilled in the art may reasonably presume that, in view of the present components (Fe^{2+}, H_2O_2, UV-VIS) in the CS '995 environment, hydroxyl radicals would be created following the Fenton and photo-Fenton reactions, radicals which might help in the oxidation reaction of said complex-forming substances.

However, an average person skilled in the art would have known that the Fenton and photo-Fenton reactions work only with transition metals ions (from Fe, Cu, etc.) (see for example Lodha et al. Indian Journal of Chemistry, Vol. 47A, March

2008, pp. 397-400). Therefore it is submitted that CS '955 does not teach nor suggest the use of **an alkaline earth metal** such as MgO as a catalyst.

US 6,793,903 (US '903) relates to oxidation of nitric oxide into nitrogen dioxide in a gas stream by high temperature decomposition of hydrogen peroxide to produce oxidative free radicals which are used instantly for the oxidation of nitric oxide (abstract). The heated surface used in US '903 may have a catalytic coating comprising a variety of compounds such as "*Fe(II), Fe(III), Cr(II), Cu(II), Pt black, Ag, or Pd*" (col. 3, lines 30-31), and in addition such as "*metal oxides, glass, quartz, Mo glass, Fe_3-x$Mn_x O_4$ spinels, Fe_2O_3 with Cu ferrite, MgO and Al_2O_3*" (col.3, lines 33-35). A person skilled in the art would clearly understand that US '903 relates to thermo-degradation of hydrogen peroxide into oxygen hydroxyl radicals in gas phase. As taught in US '903, the key feature of production of hydroxyl radicals from hydrogen peroxide is heat: "*The key element for the high temperature decomposition of hydrogen peroxide is contact with a heated surface, regardless of whether the surface has a catalytic coating or not*" (col. 3, lines 35-38).

In view of the above, an average person skilled in the art would easily understand that CS '995 and US '903 relate to two radically different chemical mechanisms.

- CS '995 relates to a chemical reaction in an aqueous solution (page 3, line 17), at ambient temperature (page 4, line 18), involving complexing agents, oxygen, light, i.e. UV-VIS (page 3, lines 17-21), optionally hydrogen peroxide (page 3, line 23), and a catalyst in the form of an inorganic soluble metal salt (page 3, lines 21-22).
- Conversely, US '903 relates to a chemical reaction on a solid surface (col. 3, lines 36-37), at high temperature to induce a phase transition (from liquid to gas), e.g. 200-500°C (claim 1), involving H_2O_2, NO and optionally a catalytic coating as described in the above paragraph.

Therefore, an average person skilled in the art, who knows that one chemical reaction can only be improved with specific catalysts, would not have found the technical motivation to choose among one of the catalytic compounds listed in US '903, and to use it into the chemical reaction of CS '995, because **the two reactions are radically different**. In reality, this person of ordinary skill in the art would have been discouraged to do so since several catalytic compounds cited in US '903, such as quartz, are known to be inert in UV-light at ambient temperature, even in the presence of peroxides; every laboratory worker uses spectrophotometric cuvettes made of quartz for routine measurements of samples comprising peroxides and exposed to UV-light. Thus, a catalytic compound chosen randomly from the list of US '903 would not have given reasonable expectations of success if used in the CS '995 reaction. The allegation of the Examiner that an average skilled person in the art would have chosen particularly MgO among the list of catalytic compounds of US '903, for use as a catalyst in the CS '905 reaction, is made with the benefit of hindsight that ignores the actual teachings of the references.